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FIXED COSTS OF OPERATING FIELD NURSERIES IN OHIO DIFFERENTIATED BY SIZE OF FIRM AND SPECIES OF PLANT

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ABSTRACT

The objective of this study was to determine annual fixed costs of operating field nurseries in Ohio differentiated by size of firm and species of Plant. In the 50-acre nursery analyzed, fixed costs per salable plant were $11.31 for Taxus, $8.08 for Juniperus, $7.56 for Viburnum, $25.09 for Acer rubrum, $17.16 for Malus, and averaged $11.29 for all species. In the 200-acre nursery they were $4.90 for Taxus, $3.48 for Juniperus, $3.27 for Viburnum, $10.87 for Acer rubrum, $7.43 for Malus, and averaged $4.88 for all species. This very significant increase in efficiency when going from the 50-acre to the 200-acre field nursery is attributable to the more efficient use of buildings, machinery, and equipment of the large nursery over the small.

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Fixed costs as a percentage of total costs in the 50-acre nursery ranged from 46% to 65%, and averaged 55% for all species. Comparable values for the 200-acre nursery were 30%, 52%, and 39%.

INTRODUCTION

To make more informed decisions as to whether to enter, leave, or expand field production, nurserymen require production, marketing and financial information. In this paper, fixed costs for production of crops representing five categories of field-grown production schemes and two sizes of nurseries in USDA Plant Hardiness Zones Five and Six are developed.

Nurserymen throughout the United States have been gradually shifting from field to container production for many species of plants (15). Large companies and many individual nurserymen who traditionally have produced field-grown stock have diversified operations by shifting part of their production to container-grown plants. Containers allow greater flexibility in production and marketing, and at least in some cases, are less expensive than field production (15). On the other hand, risk is reduced when plans are grown in the field. Field grown plants have greater buffering against variations in moisture, nutrients, and temperature. When subjected to conditions that would kill or severely damage container-grown plants with no overwintering protection, field-grown plants will often survive with little damage. It is also easier to "hold-over" field grown plants

when market conditions are not favorable. Field production continues to produce the majority of plants grown for the landscape. However, changes and competition in the industry make it imperative that nurserymen continually and systematically determine production costs.

Production cost models have recently been developed for several species of plants in the Southern and North Central regions of the U.S. (1,2,3,4,5,6,7,9,10,11,12,13,14,15,16) Most of these models, while providing excellent information for individual species, did not attempt to develop comprehensive models for complete nursery operations. Taylor, et al., developed a comprehensive model applicable to Plant Hardiness Zone 6 for container-grown crops representing five categories of container-grown production schemes and two sizes of nurseries (15). Badenhop and Phillips (2) developed a similiar study for field-grown crops in USDA Plant Hardiness Zones 7 and 8 representing five categories of field-grown production schemes and two sizes of nurseries. Procedures and data developed by the two earlier comprehensive studies have proven useful and complementary to this study.

The specific objective of the study was to determine annual fixed costs of operating field nurseries in Ohio differentiated by size of firm and species of plant.

MATERIALS AND METHODS

In the study, two model firms were synthesized using the conceptual framework of economic engineering wherein the "best proven practice" was included in each model. They were synthesized based on the Columbus, Ohio area. The complete model included developing an appropriate production cycle; schematic drawings of the physical layout, including buildings and irrigation system; lists of equipment and other items; a complete sequence by month and year of nursery operational steps beginning with land preparation and ending with loading the finished product for wholesale distribution; and budgets for fixed and variable costs (15).

Data for this study were obtained from wholesale nurseries and nursery suppliers in Ohio during the late Autumn and Winter of 1984 and the Spring of 1985. Price quotations obtained were for the 1985 production season. The basic goals in synthesizing the production facilities were to minimize labor expenses, flow and movement of plant material and equipment, maximize the number of salable plants and allow future expansion.

The model small nursery was 50 acres with 40 acres of growing space and 10 acres of production facilities, holding area, field bed area and roads. The large nursery was 200 acres in size with 175 acres of growing space and 25 acres of production facilities, holding area, field bed area and roads. Initial analysis for the 50-acre nursery showed that basic equipment needed for a modern 50-acre field nursery could

support a much larger operation. It was ascertained that it would take a nursery of at least 200 acres to use modern facilities and equipment in an economically efficient manner.

We assumed that the two model nurseries would produce a diverse line of nursery stock. The length of the production cycle for the different species grown will vary. Commonly grown nursery stock were divided into five cultural groups. While not all inclusive, the groups do permit a range of per unit costs to be developed as they relate to input costs and cultural factors. For analytical purposes, we assumed that each cultural group would occupy 20% of the nursery area (i.e. 50-acre nursery = 8 acres production plus 2 acres facility per group; 200-acre nursery = 35 acres production plus 5 acres facility per group). Annual sales capacity for the 50-acre nursery would be 20,759 plants and for the 200-acre nursery 90,867 plants. For detailed analysis, one specific plant from each group was chosen as representative of the group. While it is recognized that other plants from each category would have somewhat different requirements, it was felt that the requirements would not vary significantly in cost from the representative plant. The five groups with some of their cultural characteristics are listed below:

Group	Plant	Cultural Characteristics
I.	SLOW GROWING EVERGREENS	
	Taxus (species)	18-24" salable plant
	Buxus (species)	12" B&B
		10.2 sq. ft. per plant

II.	RAPID GROWING EVERGREENS	
	Juniperus	18-24" salable plant
	chinensis (varieties)	12" B&B
	horizontalis (varieties)	10.2 sq. ft. per plant
	Pinus strobus	
	Thuja (species)	
III.	DECIDUOUS SHRUBS	
	Viburnum (species)	18-24" salable plant
	Forsythia (species)	12" B&B
	Weigela (species)	11.9 sq. ft. per plant
	Ligustrum (species)	
IV.	SHADE TREES	
	Acer rubrum (varieties)	2" caliper
	Acer platanoides	24" B&B
	(varieties)	33.6 sq. ft. per plant
	Quercus (species)	
	Fraxinus (species)	
	Tilia (species)	
	Gleditsia (species)	
V.	ORNAMENTAL TREES	
	Malus (flowering crab)	5-6' (1 1/2 - 1 3/4"
	(species)	caliper)
	Prunus (Ornamental plums)	20" B&B
	(species)	28.7 sq. ft. per plant

Costs were established for all factors of production including management and invested capital. In economic terms, costs associated with factors of production inputted by owner/operators are often referred to as 'opportunity costs' or the income these factors could have received if they were employed elsewhere. For example, owners could usually be employed as managers at other nurseries, and money invested in land, buildings, irrigation systems, and equipment could have earned interest if it had been placed in financial institutions.

Most nurseries use cash rather than accrual accounting procedures. For this reason, the analyses were completed on a "cash" basis. Analyses on a "cash" basis do not give a true economic picture of the cost of producing a plant as it does not take into account the time value of money from the time the plant is planted until it is harvested. The analyses do, however, give a true estimate of the annual cost per salable plant. Another problem with cash accounting is taking into account the start-up period (i.e. the period from when costs are first incurred until salable plants are ready). This paper did not attempt to assess costs or alternative actions for this period.

Based upon capital requirements for establishing Ohio Field nurseries as previously reported (12,15), annual fixed costs were determined (Tables 3 and 3a). Annual fixed costs per cultural group were then determined by dividing total fixed costs by five (Tables 4 and 4a). Based on these figures, fixed costs per saleable plant were calculated (Tables 5 and 5a). These analyses

allowed cost comparisons based on cultural practices and size of nursery. See Taylor et al. (15) for details on specific fixed costs. Annual variable and total costs costs of producing three of the five cultural groups of plants are reported in companion articles in this publication (pages to).

RESULTS AND DISCUSSION

Annual fixed costs associated with capital including depreciation, interest, and taxes were $124,868 per year for the 50 acre nursery. In addition there was $102,960 allocated for general overhead and $6,678 for interest on general overhead, insurance and taxes. Fixed costs for the 50 acre nursery totalled $234,506 (Table 3). These costs were divided by five and assigned to the respective production areas of the five plant groups with each group receiving an assessment of $46,902 (Table 4). It was felt that the most reasonable way of assigning annual fixed costs initially is by area. Once the physical facility is provided, fixed costs are incurred at essentially the same amount regardless of how the nursery facility is used.

On a per-salable-plant basis there was a considerable difference in annual fixed costs among plant groups (Table 5). In the 50-acre nursery, they were: $11.31 for Group I (Taxus), $8.08 for Group II (Juniperus), $7.56 for Group III (Viburnum), $25.09 for Group IV (Acer rubrum), and $17.16 for Group V (Malus. The average over all groups was $11.29. Fixed costs for group IV plants were more than three times as much as for group III.

These costs were proportionate to the number of salable plants per annum produced in allocated space. Fixed costs as a percentage of total costs ranged from 46% to 65% in the 50-acre nursery and averaged 55% for the five groups (Table 5).

For the 200-acre nursery, annual fixed costs associated with capital investment (depreciation, interest, insurance and taxes) were $270,110. An additional $163,425 was allocated for general overhead and $10,990 for interest on general overhead, insurance, and taxes making a total of $444,525 annual fixed costs for the 200 acre nursery (Table 3a). Assessment per plant group was $88,905 (Table 4a). Fixed costs per-salable-plant were: $4.90 for Group I, $3.48 for Group II, $3.27 for Group III, $10.87 for Group IV, and $7.43 for Group V and averaged $4.88 for all groups (Table 5a). Fixed costs as a percent of total costs were considerably lower than for the 50-acre nursery ranging from 30% to 52% and averaged 39% for all groups (Table 5a). This lower percentage was associated with the lower capital requirement per salable plant capacity.

Fixed costs per-salable-plant were substantially lower for the 200-acre nursery compared to the 50-acre. For Group I the difference was $6.41, for Group II $4.60, for Group III $4.29, for Group IV $14.22, and for Group V $9.73 and averaged $6.41 for all groups. This more than doubling in efficiency when going from the 50-acre to the 200-acre nursery is once again attributable to the more efficient use of buildings, machinery, and equipment of the large nursery over the small.

While many nurserymen and others concerned with the industry might feel that the reported fixed cost figures ranging from 30% to 65% of total costs depending upon size of firm and species of plant might be high, these percentages are in line with those for similar industries with new facilities.

Brumfield et. al. (8) in a synthesized analyses of overhead costs of greenhouse firms found fixed (overhead) costs as a percent of sales to range from about 45% to over 67% depending on size of firm and market channel. The values of this study are not directly comparable with Brumfield et. al. (percent of total costs versus percent of sales). However, if marketing costs and potential profit were taken into account so that a direct comparison could be made, the fixed costs from the Brumfield study, as a percent of total costs, would still be similiar to those reported in this study. Recent studies on nurseries, however, did show lower fixed costs as a percentage of total costs.

Badenhop and Phillips (2), for USDA Plant Hardiness Zones 7 & 8, showed fixed costs ranging from 37% to 48% of total costs in a 50-acre nursery and from 27% to 36% in a 100-acre nursery. Most of the difference between the two studies could be accounted for by differences in budgeting. Bandenhop and Phillips did not provide for irrigation or drainage, two very expensive procedures provided for in this study. They also allocated less for nursery overhead. Finally, they used different procedures for computing interest on investment. In computing interest on depreciable

items, the calculations by Badenhop and Phillips were based on one-half the original value of depreciable items to reflect the recovery of those items through depreciation. In this study, interest was computed on the total cost of depreciable items.

Taylor, et. al., (15) in a study of container operations in USDA Plant Hardiness Zone 6 found fixed (overhead) costs as a percent of total costs to range from 37% to 51% depending on size of firm and number of salable plants. Analytical procedures in the Taylor, et. al., study were identical to this study. The major difference in that study vs. this study is in the number of salable plants produced per year. In the container study, a nursery containing approximately 8 acres of growing space would produce about 95,650 salable plants per year, and a nursery containing approximately 16 acres of growing space would produce about 192,095 salable plants per year. Therefore, fixed (overhead) costs were distributed over many more plants. Also capital requirements per salable plant capacity were much lower in the container nurseries. For the 8-acre (growing space) nursery, they ranged from $4.63 to $9.09 per capital requirement per salable plant capacity. In the 16-acre (growing space) nursery, they ranged from $3.71 to $7.39. As reported earlier, capital requirements per salable plant in this study ranged from $10.16 to $65.94 depending upon species of plant and size of field nursery (15).

One of the major reasons for the large difference in capital requirements per salable plant capacity lies in the plant

rotations. The container nursery operated on a two year rotation while the rotations for this field study range from four years in The case of Group III (Viburnum) and Group V plants (Malus) to seven years in the case of Group I (Taxus) plants.

Nurserymen having established facilities might well consider annual fixed costs to be lower than those reported here. This is especially true if they calculate depreciation and repairs on the original value of land improvements, buildings, machinery and equipment and if they place a low value on their own management input. Good management for planning purposes, however, dictates computing depreciation and repairs on the current value of facilities and equipment rather than on original cost. It also dictates placing a value on managerial time that would be comparable to salaries paid in competitive firms.

SUMMARY AND IMPLICATIONS

Fixed costs per salable plant in the 50-acre nursery ranged from $7.56 to $25.09 and averaged $11.29. In the 200-acre nursery comparable costs were $3.27 to $10.87 and averaged $4.88. The greater than 100% gain in efficiency when going from the 50 to 200 acre nursery is attributable to more efficient use of buildings, machinery, and equipment. Fixed costs as a percentage of total costs in the 50-acre nursery ranged from 46% to 65% and averaged 55% for all species. Comparable values for the 200-acre nursery were 30% to 52%, and averaged 39%. Differences in fixed costs among plant resulted from a combination of space

requirements and the number of years a plant would be in rotation.

Implications

A comparison of total costs of producing "B & B" plants in a 50-acre nursery in the field in USDA Plant Hardiness Zones 5 and 6 with prices in producers' wholesale catalogs would undoubtedly show selling prices lower than total annual costs. In fact, a comparison of costs with prices for the 200-acre field nursery would also, at best, show marginal returns. In fact, if one were to add costs of selling, very few producers would presently be charging enough to cover all costs, let alone profits. How then can producers continue to operate? The answer lies in how producers both experience and compute costs. We have used the economic and accounting method which includes both explicit and implicit costs. Explicit costs are those that are paid directly and easily determined, e.g. cost of liners, soil media, polyethylene, chemicals, labor, etc. Implicit costs are those that are more difficult to determine, such as the cost of equity capital and implied managerial salaries. The way these costs are determined varies significantly from firm to firm. Well-established nurseries are usually very accurate in determining explicit costs, but often do not consider all implicit costs. They base their costs on "cash flow" and profit and loss on "tax accounting." These established nurseries may have purchased land at low cost, be working with depreciated equipment and may be assigning low if any value to their management; in this case

determined costs would be at a much lower level than presented in this paper. Also, as pointed out earlier, careful site selection could significantly reduce fixed (overhead) costs. However, if one were to start a new field nursery, in a "normal" USDA Plant Hardiness Zone 5 or 6 site, costs would probably be very close to those presented here.

For the industry, selling nursery products below "accounting costs" implies that well-established nurseries, operating essentially debt free, would have strong staying power whereas those who have just started or are heavily in debt may not be able to survive, especially if they are relaying on their field operation to meet all overhead expenses. Second, starting a field nursery (unless it were quite large) in USDA Plant Hardiness Zones 5 and 6 would probably not prove profitable unless items like buildings, equipment, machinery, m;anagement, etc., could be shared with other enterprises or unless selling prices of nursery products in the zones increased substantially. At current prices for nursery products, this study shows that the return on investment for establishing new, independently operating, field nurseries in USDA Plant Hardiness Zones 5 and 6 would be marginal if not negative.

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TABLE 1.--Plant Densities and losses for Field Production of Nursery Plants in Ohio, 1985.

Group	Description	Size of Salable Plant	Years in Rotation	Spacing Between Rows	Spacing In Rows	Sq. Ft. Per Plant*	Plants Per Acre	Est. Percent Loss**
I	Slow Growing Evergreens - Taxus	18-24"	7	44"	28"	10.2	4,272	15
II	Fast Growing Evergreens - Juniperus	18-24"	5	44"	28"	10.2	4,272	15
III	Deciduous Shrubs - Viburnum	3-4'	4	48"	30"	11.9	3,652	15
IV	Shade Tree - Acer Rubrum	2" dia.	5	96"	42"	33.6	1,298	10
V	Ornamental Tree - Malus	5-6'(1 1/2")	4	96"	36"	28.7	1,518	10

*Sq. ft. per plant includes necessary perimeter roads.

**Assume 1/2 of loss between first and second year and remainder in last year of production. Losses in the last year of production would be left in the field.

TABLE 2.--Planting and Harvesting Requirements for a 50 Acre* Field Nursery in Ohio, 1985.

Plant Group	Description	Propagation**	Bedding Area***	Field Planting			
		Units Stuck	Rooted Cuttings Planted	Acres	Acres Planted Per Year	Units Planted Per Year	Units Harvested Per Year****
I	Slow Growing Evergreens - Taxus	7,914	6,088	8	1.14	4,870	4,140
II	Fast Growing Evergreens - Juniperus	11,107	8,544	8	1.60	6,835	5,810
III	Deciduous Shrubs - Viburnum	11,869	9,130	8	2.00	7,304	6,208
IV	Shade Tree - Acer Rubrum*****	-	-	8	1.60	2,076	1,869
V	Ornamental Tree - Malus*****	-	-	8	2.00	3,036	2,732
	Total	30,890	23,762	40	8.34	24,121	20,759

*50 total acres with 40 acres in field growing space, and 10 acres in production facilities, holding area, field bed area, roads, etc.

**For each plant available for transplanting as a rooted cutting into the bedding area, it is estimated that 1.3 cuttings would need to be stuck in the propagation facility.

***For each plant available for transplanting into the field, it is estimated that 1.25 rooted cuttings would need to be planted in the bedding area.

****Assume 1/2 dug in Fall for Fall sales and overwintering and 1/2 dug in the Spring.

*****Shade and Ornamental Trees would be purchased as bare root liners for planting directly into the field.

TABLE 2a.--Planting and Harvesting Requirements for a 200 Acre* Field Nursery in Ohio, 1985.

Plant Group	Description	Propagation** Units Stuck	Bedding Area*** Rooted Cuttings Planted	Field Planting Acres	Acres Planted Per Year	Units Planted Per Year	Units Harvested Per Year****
I	Slow Growing Evergreens - Taxus	37,710	26,700	35	5.00	21,360	18,156
II	Fast Growing Evergreens - Juniperus	48,594	37,380	35	7.00	29,904	25,418
III	Deciduous Shrubs - Viburnum	51,927	39,944	35	8.75	31,955	27,162
IV	Shade Tree - Acer Rubrum*****	-	-	35	7.00	9,086	8,177
V	Ornamental Tree - Malus*****	-	-	35	8.75	13,283	11,954
	Total	138,231	104,024	175	36.50	105,588	90,867

*200 total acres with 175 acres in field growing space, and 25 acres in production facilities, holding area, field bed area, roads, etc.

**For each plant available for transplanting as a rooted cutting into the bedding area, it is estimated that 1.3 cuttings would need to be stuck in the propagation facility.

***For each plant available for transplanting into the field, it is estimated that 1.25 rooted cuttings would need to be planted in the bedding area.

****Assume 1/2 dug in Fall for Fall sales and overwintering and 1/2 dug in the Spring.

*****Shade and Ornamental Trees would be purchased as bare root liners for planting directly into the field.

Table 3.--Annual Fixed Costs (Dollars) for a 50 acre* Field Nursery in Ohio, 1985.

Item	Description	Depreciation**	Interest***	Insurance and Taxes****	Total
Land	Unimproved land	---	12,000	2,000	14,000
+ Improvements	Grading, tiling, graveling, pond	5,182	13,819	2,303	21,304
Subtotal		5,182	25,819	4,303	35,304
Buildings					
Office and restrooms	20′ x 40′	1,260	3,360	685	5,305
Plant and supply storage	40′ x 50′	1,800	4,800	978	7,578
Machinery storage and shop	40′ x 50′	1,800	4,800	978	7,578
Polyhouse structures (5 ea)	200′ x 20′	1,242	1,657	338	3,237
Subtotal		6,102	14,617	2,979	23,698
Machinery and Equipment					
Tractor, 100 HP	100 HP, diesel fuel	2,545	3,393	107	6,045
Tractor, 34 HP (2 ea)	34 HP, gas fuel	2,611	3,481	110	6,202
Articulated 4 Wheel Drive Loader	Swinger 320 - lift cap. = 3,000lbs	3,420	4,560	144	8,124
Tree spade	530P Handles 20",22",&24" + lift pads	3,821	1,019	32	4,872
Forks	For front end loaders	99	132	4	235
Plow	3 - 14 inch plows	235	314	10	559
Disk	8′ wide	351	468	15	834
Harrow	10′ wide	59	78	2	139
Cultimulcher - bed area	10′ wide	342	456	14	812
Sprayrig (boom sprayer)	100 gallon tank with 10′ boom	181	169	5	355
Transplanter, 3 row	3-20 inch row bed transplanter	675	900	28	1,603
Transplanter, one row	Tree planter	450	600	19	1,069
Permanent irrigation/well pump	100 HP electric pump	1,638	4,368	138	6,144
Inground irrigation/bed area	PVC pipe/valves	498	1,328	42	1,868
Above ground irrigation/bed area	Aluminum pipe/valves/sprinklerheads	329	220	7	556
Inground irrigation storage/holding	PVC pipe/valves	311	829	26	1,166
Above ground irr. storage/holding	Aluminum pipe/valves/sprinklerheads	433	289	9	731
Traveler gun - field irrigation	450-500 gallons per minute	1,980	2,640	83	4,703
Portable irrigation pump	40 HP P.T.O irrigation pump/foot valve	38	51	2	91
Airblast sprayer	300 gallon high pressure on trailer	463	432	14	909
Fertilizer injector (2 ea)	26 gallon injector - bed use	309	206	6	521
Transplanter, 2 row	2-42 inch row field transplanter	504	672	21	1,197
U Blade - field	18" for undercutting	43	29	1	73
Undercutter - bed	Bed undercutter, 50" blade, lift tines	37	34	1	72
Fertilizer sidedresser	2 row sidedresser	90	120	4	214
Cultivator, 2 row	2 row field cultivator	219	204	6	429
Wagon (4 ea)	4 wheel, farm wagon	712	949	30	1,691
Cultivator, 3 row	3 row bed cultivator	289	270	9	568
Truck	1/2 ton pickup truck	2,427	1,618	51	4,096
Pallets (181 ea)	Wooden	977	261	8	1,246
Handtools (20 sets)	Miscellaneous	360	240	8	608
Seeder	Broadcast seeder	16	21	1	38
Mower	7′ - 3 blade mower	205	274	9	488

Table 3 Con't

Item	Description	Depreciation**	Interest***	Insurance and Taxes****	Total
Flatbed Truck (1/2 unit)	24 ft. flatbed, gas fuel	3,780	2,520	79	6,379
Heating System for Propagation					
Gas fired unit heater - Modine	200,000 BTU (input)	99	132	4	235
Fan jet - Acme		10	12	#	22
Thermostat	Two stage	4	5	#	9
Set-up for propane	Vent., reg., etc.	9	12	#	21
Set-up for heating system	Plywood, braces, bolts, etc.	9	12	#	21
Other propagation materials					
Misting system (3 ea)	Mist-a-matic	336	90	3	429
Pipe and nozzles	For misting system	135	36	1	172
Treated boards	5/4" x 8" x variable length	110	29	1	140
Heater cable		141	38	1	180
Subtotal		31,300	33,511	1,055	65,866
Total for Depreciation, Interest, Insurance and Taxes		42,584	73,947	8,337	124,868
General Overhead					
Utilities	Telephone, electric, gas heat				6,200
Licenses and bonds					400
General repairs and maintenance	Buildings, grounds, roads				7,060
Advertising and printing					1,200
Insurance, personnel##	Workmen's comp., FICA, health, unemp.				19,200
Travel and professional fees					1,900
Administrative and management###	Clerical, operator, supervisory, labor and office supplies				66,000
Miscellaneous					1,000
Subtotal					102,960
Interest on General Overhead, Insurance and Taxes	12% per annum for 6 months on a total of $111,297				6,678
Total Annual Fixed Costs					234,506

*Fifty acre total, 40 acres growing space, 10 acres production facilities, holding area, field bed area, roads, etc.

**Depreciation was estimated by dividing initial cost adjusted for a 10% salvage value, by the years of useful life.

***Interest costs were estimated by multiplying the initial value of land, building, equipment and machinery by the interest rate, 12% per annum.

****Insurance and taxes.

Land and improvements--Only taxes are assessed, at a rate of $20.00 per $1000.00 of market value.

Buildings--Taxes assessed at a rate of $20.00 per $1000.00 of market value. Insurance, $500.00 deductible, at $4.46 per $1000.00 of market value. Total for category, $24.46 per $1000.00.

Machinery and equipment--Taxes are not assessed in state of Ohio on personal property. Insurance, $500.00 deductible, at $3.78 per $1000.00 of initial value.

#Less than $0.50.

##Insurance for personnel was estimated at 32% of salaries for owner/operator, supervisor, and clerical.

###Owner/operator = $30,000, Supervisor = $20,000, Clerical = $10,000, Supplies 10% or $6,000. Total = $66,000.

Table 3a.--Annual Fixed Costs (Dollars) for a 200 Acre* Field Nursery in Ohio, 1985.

Item	Description	Depreciation**	Interest***	Insurance and Taxes****	Total
Land	Unimproved land	---	48,000	8,000	56,000
+ Improvements	Grading, tiling, graveling, pond	12,789	34,105	5,684	52,578
Subtotal		12,789	82,105	13,684	108,578
Buildings					
Office and restrooms	20′ x 40′	1,260	3,360	685	5,305
Plant and supply storage	40′ x 50′	1,800	4,800	978	7,578
Machinery storage and shop	40′ x 50′	1,800	4,800	978	7,578
Polyhouse structures (21 ea)	200′ x 20′	5,218	6,958	1,418	13,594
Subtotal		10,078	19,918	4,059	34,055
Machinery and Equipment					
Tractor, 100 HP	100 HP, diesel fuel	2,545	3,393	107	6,045
Tractor, 60 HP	60 HP, diesel fuel	1,838	2,450	77	4,365
Tractor, 34 HP (4 ea)	34 HP, gas fuel	5,221	6,962	219	12,402
Articulated 4-Wh. Dr. Loader (2 ea)	Swinger 220 - lift cap. = 2,000lbs	4,500	6,000	189	10,689
Articulated 4-Wh. Dr. Loader (2 ea)	Swinger 320 - lift cap. = 3,000lbs	6,840	9,120	287	16,247
Tree spade (2 ea)	530P Handles 20",22", & 24" + liftpads	7,641	2,038	64	9,743
Forks	For front-end loaders	396	528	17	941
Plow	3 - 14 inch plows	235	314	10	559
Disk	8′ wide	351	468	15	834
Harrow	10′ wide	59	78	2	139
Cultimulcher - bed area	10′ wide	342	456	14	812
Sprayrig (boom sprayer)	100 gallon tank with 10′ boom	181	169	5	355
Transplanter, 3 row	3-20 inch row bed transplanter	675	900	28	1,603
Transplanter, one row	Tree planter	450	600	19	1,069
Permanent irrigation/well pump	100 HP electric pump	1,638	4,367	138	6,143
Inground irrigation/bed area	PVC pipe/valves	1,557	4,153	131	5,841
Above ground irrigation/bed area	Aluminum pipe/valves/sprinklerheads	782	522	16	1,320
Inground irrigation storage/holding	PVC pipe/valves	808	2,155	68	3,031
Above ground irr. storage/holding	Aluminum pipe/valves/sprinklerheads	1,491	994	31	2,516
Traveler gun - field irrigation	450-500 gallons per minute	1,980	2,640	83	4,703
Portable irrigation pump	40 HP P.T.O irrigation pump/foot valve	38	51	2	91
Airblast sprayer	300 gallon high pressure on trailer	463	432	14	909
Fertilizer injector (2 ea)	26 gallon injector	307	205	6	518
Transplanter, 2 row	2-42 inch row field transplanter	504	672	21	1,197
U-Blade - field	18" for undercutting	43	29	1	73
Undercutter - bed	Bed undercutter, 50" blade, lift tines	37	34	1	72
Fertilizer sidedresser	2 row sidedresser	90	120	4	214
Cultivator, 2 row (2 ea)	2 row field cultivator	450	420	13	883
Wagon (8 ea)	4 wheel, farm wagon	1,424	1,899	60	3,383
Cultivator, 3 row	3 row bed cultivator	289	270	9	568
Truck (2 ea)	1/2 ton pickup truck	4,855	3,236	102	8,193
Pallets (482 ea)	Wooden	2,603	694	22	3,319
Handtools (76 Sets)	Miscellaneous	1,368	912	29	2,309
Seeder	Broadcast seeder	16	21	1	38
Mower	7′ - 3 blade mower	205	274	9	488

Table 3a Con't

Item	Description	Depreciation**	Interest***	Insurance and Taxes****	Total
Flatbed truck	24 ft. flatbed, gas fuel	7,560	5,040	159	12,759
Heating System for Propagation					
Gas fired unit heaters (2 ea)	2000,000 BTU (input)	199	265	8	472
Fan jet - Acme (2 ea)		19	24	1	44
Thermostat (2 ea)	Two stage	8	11	‡	19
Set-up for propane (2 ea)	Vent., reg., etc.	18	24	1	43
Set-up for heating system (2 ea)	Plywood, braces, bolts, etc.	18	24	1	43
Other Propagation Materials					
Misting system (6 ea)	Mist-a-matic	672	179	6	857
Pipe and nozzles	For misting system	270	72	2	344
Treated boards	5/4" x 8" x variable length	440	117	4	561
Heater cable		567	151	5	723
Subtotal		61,993	63,483	2,001	127,477
Total for Depreciation, Interest Insurance and Taxes		84,860	165,506	19,744	270,110
General Overhead					
Utilities	Telephone, electric, gas heat				9,200
Licenses and bonds					600
General repairs and maintenance	Buildings, grounds, roads				12,200
Advertising and printing					1,800
Insurance, personnel##	Workmen's comp., FICA, health, unemp.				30,400
Travel and professional fees					2,725
Administrative and management###	Clerical, operator, supervisory, labor and office supplies				104,500
Miscellaneous					2,000
Subtotal					163,425
Interest on General Overhead Insurance, and Taxes	12% per annum for 6 months on a total of $183,169				10,990
Total Annual Fixed Costs					444,525

*Two hundred acre total, 175 acres growing space, 25 acres production facilities, holding area, field bed area, roads, etc.

**Depreciation was estimated by dividing initial cost adjusted for a 10% salvage value, by the years of useful life.

***Interest costs were estimated by multiplying the initial value of land, building, equipment and machinery by the interest rate, 12% per annum.

****Insurance and taxes.

Land and improvements--Only taxes are assessed, at a rate of $20.00 per $1000.00 of market value.

Buildings--Taxes are assessed at a rate of $20.00 per $1000.00 of market value. Insurance, $500.00 deductible, at $4.46 per $1000.00 of market value. Total for category, $24.46 per $1000.00.

Machinery and equipment--Taxes are not assessed in state of Ohio on personal property. Insurance, $500.00 deductible, at $3.78 per $1000.00 of initial value.

‡Less than $0.50.

##Insurance for personnel was estimated at 32% of salaries for owner/operator, supervisors, and clerical.

###Owner/operator = $35,000, 2 Supervisors @ $20,000 ea. = $40,000, 2 Clerical @ $10,000 = $20,000, Supplies 10% or $9,500. Total = $104,500.

TABLE 4.--Summary of Annual Fixed Costs (Dollars) of Operating a 50 Acre* Field Nursery in Ohio, 1985.

Item	Group I (Taxus)	Group II (Juniperus)	Group III (Viburnum)	Group IV (Acer rubrum)	Group V (Malus)	Total
Fixed Cost						
Land and improvements	7,061	7,061	7,061	7,061	7,061	35,304**
Buildings	4,740	4,740	4,740	4,740	4,740	23,698**
Machinery and equipment	13,173	13,173	13,173	13,173	13,173	65,866**
General overhead	20,592	20,592	20,592	20,592	20,592	102,960**
Interest on general overhead, insurance, and taxes	1,336	1,336	1,336	1,336	1,336	6,678**
Subtotal	46,902	46,902	46,902	46,902	46,902	234,506**
Salable Plants per Year	4,140	5,810	6,208	1,869	2,732	20,759
Annual Fixed Costs per Salable Plant	11.31	8.08	7.56	25.09	17.16	11.29

*Total Nursery - 50 acres, 40 acres of growing space, 10 acres production facilities, holding & field bed area, roads, etc.
**Individual figures do not always add to the total due to rounding.

TABLE 4a.--Summary of Annual Fixed Costs (Dollars) of Operating a 200 Acre* Field Nursery in Ohio, 1985.

Item	Group I (Taxus)	Group II (Juniperus)	Group III (Viburnum)	Group IV (Acer rubrum)	Group V (Malus)	Total
Fixed Cost						
Land and improvements	21,716	21,716	21,716	21,716	21,716	108,578**
Buildings	6,811	6,811	6,811	6,811	6,811	34,055**
Machinery and equipment	25,495	25,495	25,495	25,495	25,495	127,477**
General overhead	32,685	32,685	32,685	32,685	32,685	163,425**
Interest on general overhead, insurance, and taxes	2,198	2,198	2,198	2,198	2,198	10,990**
Subtotal	88,905	88,905	88,905	88,905	88,905	444,525**
Salable Plants per Year	18,156	25,418	27,162	8,177	11,954	90,867
Annual Fixed Cost per Salable Plant	4.90	3.48	3.27	10.87	7.43	4.88

*Total Nursery - 200 acres, 175 acres of growing space, 25 acres production facilities, holding & field bed area, roads, etc.
**Individual figures do not always add to the total due to rounding.
***Tree liners were purchased rather than propogated. Liner costs were included under materials.

TABLE 5.--Summary of Fixed, Variable, and Total Costs (Dollars) per Salable Plant of Operating a 50 Acre Field Nursery in Ohio, 1985.

Item	Group I (Taxus)		Group II (Juniperus)		Group III (Viburnum)		Group IV (Acer rubrum)		Group V (Malus)		Average	
	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost
Fixed Cost Items												
Land and Improvements	1.70	(10)	1.22	(10)	1.14	(9)	3.78	(7)	2.58	(7)	1.70	(8)
Buildings	1.14	(7)	.82	(7)	.76	(6)	2.54	(5)	1.73	(5)	1.14	(6)
Machinery and Equipment	3.18	(18)	2.27	(18)	2.12	(18)	7.05	(13)	4.82	(13)	3.17	(16)
General Overhead	4.97	(28)	3.54	(28)	3.32	(28)	11.01	(20)	7.54	(20)	4.96	(24)
Interest on General Overhead, Insurance, and Taxes	.32	(2)	.23	(2)	.22	(2)	.71	(1)	.49	(1)	.32	(1)
Subtotal	11.31	(65)	8.08	(65)	7.56	(63)	25.09	(46)	17.16	(46)	11.29	(55)
Variable Cost Items												
Propagation	.66	(4)	.27	(2)	.26	(3)	**		**		.29	(1)
Materials	.98	(5)	.75	(6)	.76	(6)	16.56	(30)	10.05	(28)	3.45	(17)
Machinery and Equipment	1.42	(8)	1.03	(8)	.96	(8)	5.30	(10)	3.39	(9)	1.78	(9)
Labor	2.75	(16)	2.13	(17)	2.21	(18)	5.97	(11)	5.10	(14)	3.02	(15)
Interest on Operating Capital	.35	(2)	.25	(2)	.25	(2)	1.67	(3)	1.11	(3)	.51	(3)
Subtotal	6.16	(35)	4.43	(35)	4.44	(37)	29.50	(58)	19.65	(54)	9.05	(45)
Total Costs per Salable Plant	17.47	(100)	12.51	(100)	12.00	(100)	54.58	(100)	36.82	(100)	20.34	(100)

*Total Nursery - 50 acres, 40 acres of growing space, 10 acres production facilities, holding & field bed area, roads, etc.
**Tree liners were purchased rather than propagated. Liner costs were included under materials.

TABLE 5a.--Summary of Fixed, Variable, and Total Costs (Dollars) per Salable Plant of Operating a 200 Acre* Field Nursery in Ohio, 1985.

Item	Group I (Taxus)		Group II (Juniperus)		Group III (Viburnum)		Group IV (Acer rubrum)		Group V (Malus)		Average	
	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost
Fixed Cost Items												
Land and Improvements	1.20	(13)	.85	(12)	.80	(11)	2.66	(7)	1.82	(7)	1.19	(10)
Buildings	.38	(4)	.27	(4)	.25	(4)	.83	(2)	.57	(2)	.37	(3)
Machinery and Equipment	1.40	(15)	1.00	(14)	.94	(13)	3.11	(9)	2.13	(9)	1.40	(11)
General Overhead	1.80	(19)	1.28	(18)	1.20	(17)	4.00	(11)	2.73	(11)	1.80	(14)
Interest on General Overhead, Insurance, and Taxes	.12	(1)	.08	(1)	.08	(1)	.27	(1)	.18	(1)	.12	(1)
Subtotal	4.90	(52)	3.48	(49)	3.27	(46)	10.87	(30)	7.43	(30)	4.88	(39)
Variable Cost Items												
Propagation	.20	(2)	.11	(1)	.10	(1)	**		**		.10	(1)
Materials	.94	(10)	.77	(11)	.77	(11)	13.88	(39)	9.02	(37)	3.07	(25)
Machinery and Equipment	.65	(7)	.47	(7)	.52	(8)	3.03	(9)	2.51	(10)	1.02	(8)
Labor	2.45	(26)	2.05	(29)	2.19	(31)	6.43	(18)	4.79	(19)	2.93	(24)
Interest on Operating Capital	.25	(3)	.21	(3)	.22	(3)	1.40	(4)	.98	(4)	.43	(3)
Subtotal	4.49	(48)	3.61	(51)	3.80	(54)	24.74	(70)	17.30	(70)	7.55	(61)
Total Costs per Salable Plant	9.39	(100)	7.09	(100)	7.07	(100)	35.61	(100)	24.73	(100)	12.43	(100)

*Total Nursery - 200 acres, 175 acres of growing space, 25 acres production facilities, holding & field bed area, roads, etc.
**Tree liners were purchased rather than propagated. Liner costs were included under materials.